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Materiel Test Procedure 10-2-212  
General Equipment Test Activity

U.S. ARMY TEST AND EVALUATION COMMAND  
COMMODITY ENGINEERING TEST PROCEDURE

PREPARATION METHODS AND EQUIPMENT - FOOD SERVICE

1.

OBJECTIVE\*

This document provides test methodology and testing techniques to determine the technical performance and safety characteristics of food service preparation methods and equipment as described in Materiel Need (MN) and to determine the items suitability for service tests.

2.

BACKGROUND

a. The Armed Forces of the United States recognize the basic need for good food to maintain a fighting force in top physical condition. Meals specified in the master menu are nutritionally adequate and provide variety in the soldier's diet. Foods of high quality are purchased for the Armed Forces, and good equipment is provided for the preparation. These factors, however, are only the beginning. Some of the other considerations are outlined below.

- 1) Food must be prepared in such a way that a maximum amount of the vitamins and minerals found in the raw product will be retained. In addition, the food must be tasty.
- 2) Meals must be served attractively because the soldier "eats first with his eyes". That is, he accepts or rejects with his eyes the food items on the serving line or on his own tray.
- 3) The cook must know his equipment. What its capabilities are, how he should use it, and how he can keep it in the best working condition.
- 4) Mess personnel must observe safety precautions and the rules of personnel hygiene and messhall sanitation as specified in TM 10-405 and FM 21-10.

b. To support any army at a large installation is a task enough, but when that army moves to the field the problems inherent in food preparation are compounded. To maintain the high standards of food preparation achieved at the large permanent installations and still provide the degree of mobility required of a unit in the field requires special considerations.

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\*This MTP is intended to be used as a basic guide in preparing actual test plans for the subject material. Specific criteria and test procedures must be determined only after careful appraisal of pertinent MN, and any other applicable documents.

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c. The chief differences between the field mess and the garrison mess are in the types of equipment available for use, the conditions under which the equipment must be operated, and the manner in which the troops are fed. Meals must be prepared and served in the open in all kinds of weather. The area available for setting up a field mess frequently has many undesirable features, and the storage and sanitation facilities characteristic of the garrison mess are makeshift at best in the field mess, and may be lacking entirely.

3. REQUIRED EQUIPMENT

The following equipment, or suitable substitutes, will be required to accomplish the testing procedures as specified by this document:

a. Instrumentation requirements for evaluating the test item.

- 1) Thermocouples and associated equipment to measure test item temperature.
- 2) Thermometer (Fahrenheit Scale).
- 3) Barometer.

b. Scales, weighing, calibrated.

c. Stopwatches.

d. Field stove(s), as applicable.

e. Photographic equipment.

f. Appropriate quantities of rations to fulfill test requirements.

g. Appropriate materials handling equipment (MHE).

h. Appropriate transportation capabilities and facilities.

i. Appropriate test site(s).

j. Laboratory and/or bench testing facilities, as required.

k. Appropriate refrigeration and storage equipment.

4.

REFERENCES

- A. Army Regulation 40-5 Medical Services: Preventive Medicine, Appendix 5, Basic Dietary Standards for the U.S. Army.
- B. USAMC Pamphlet 706-134 Engineering Design Handbook: Maintainability Guide for Design.
- C. USATECOM Regulation 70-23 Research and Development: Equipment Performance Reports (EPRs).
- D. USATECOM Regulation 385-6 Safety: Verification of Safety of Materiel During Testing.
- E. USATECOM Regulation 700-1 Value Engineering.
- F. USATECOM Regulation 750-15 Maintenance of Supplies and Equipment: Maintenance Evaluation During Testing.
- G. USAGETA Document Human Factors Evaluation Data for General Equipment (HEDGE).
- H. USAGETA Regulation 70-4 Research and Development: Human Factors and General Equipment Testing.

- I. USAGETA Regulation 705-4 Research and Development of Materiel: Instrumentation Services and Materials Analysis Services.
- J. FED-STD-101 Preservation, Packaging, and Packing Materials: Test Procedures.
- K. FED-STD-151 Metals: Test Methods.
- L. FED-STD-406 Plastic, Methods of Testing.
- M. MIL-STD-129 Marking for Shipment and Storage.
- N. MIL-STD-130 Identification Marking of US Military Property.
- O. MIL-STD-209 Slinging Eyes and Attachments for Lifting and Tying Down Military Equipment.
- P. MIL-STD-810 Environmental Test Methods.
- Q. MIL-STD-1186 Cushioning, Anchoring, Bracing, Blocking, and Waterproofing, and Appropriate Test Methods.
- R. MTP 10-2-037 Field Cooking Equipment.
- S. MTP 10-2-500 Physical Characteristics.
- T. MTP 10-2-501 Operator Training and Familiarization.
- U. MTP 10-2-502 Durability.
- V. MTP 10-2-503 Surface Transportability (General Supplies and Equipment).
- W. MTP 10-2-505 Human Factors Evaluation
- X. MTP 10-2-507 Maintenance Evaluation.
- Y. MTP 10-2-508 Safety.
- Z. MTP 10-2-511 Quality Assurance.
- AA. MTP 10-2-512 Reliability.
- AB. MTP 10-4-001 Desert Environmental Test of General Supplies and Equipment.
- AC. MTP 10-4-003 Tropic Environmental Test of General Supplies and Equipment.
- AD. MTP 10-4-004 Arctic Environmental Test of Rations.
- AE. FM 21-10 Military Sanitation.
- AF. TM 10-405 Army Mess Operation.
- AG. Cochran and Cox, Experimental Design, John Wiley and Son, 1950.
- AH. Churchman, C. West and Ratoosh, Philburn, Measurement, Definitions and Theories, John Wiley and Son, 1959.
- AI. Methods of Analysis of the Association of Official Agricultural Chemists, Ninth Edition, 1960.

5. SCOPE

5.1 SUMMARY

This procedure describes the preparation for, and methods of, evaluating the technical performance and safety characteristics of food service preparation methods and equipment. To assess the degree of conformance with required standards and established criteria, the food service preparation methods and equipment should be subjected to the following:

- a. Preparation for Test - A pretest inspection to determine the condition of the test item and its associated package, upon arrival at the test site. A determination of the test items physical characteristics, and a personnel training and familiarization program.
- b. Food Preparation and Equipment Evaluation - An evaluation to examine specific design characteristics including the ability of the test item to perform its primary function. Also, tests for nutritional adequacy will be conducted.
- c. Environmental Tests - A series of evaluations designed to examine and measure changes in the performance and physical characteristics of the test item when it is subjected to controlled changes in environmental parameters.
- d. Transportability - An evaluation to determine the ability of the test item in its shipping configuration to withstand the forces which it will experience during normal handling and transporting.
- e. Durability - An evaluation of the food service equipment to retain its original physical and performance characteristics after periods of extended operation.
- f. Maintenance Evaluation - To determine and verify the maintenance/maintainability characteristics and requirements of the test item; an appraisal of the design and of the maintenance test package, and the calculation of indicators which express the effects of the preceding aspects.
- g. Safety - An evaluation to determine the safety characteristics and possible hazards of the test item.
- h. Human Factors - An evaluation to determine the adequacy of the design and performance requirements of the test item and its accessories in terms of conformance to accepted human factors engineering design criteria.
- i. Value Analysis - An evaluation directed at analyzing the primary function of the test item for the purpose of cost reduction without compromising performance, reliability, quality, maintainability or safety.
- j. Quality Assurance - A review for the purpose of determining and evaluating defects in packaging, material, and workmanship.

## 5.2 LIMITATIONS

This materiel test procedure is limited to food service preparation methods and equipment used in field messes utilizing the standard B ration or operational packaged rations.

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6. PROCEDURES

6.1 PREPARATION FOR TEST

NOTE: Prepare an EPR in accordance with applicable procedures in USATECOM Regulation 70-23 for any items that are missing, damaged or considered inadequate when completing the following procedures:

6.1.1 Inspection

Upon receipt of the test item at the test site, perform the following:

a. Visually inspect the test item; record and photograph evidence of any damage incurred during transport.

b. Before offloading a shipment, inspect and evaluate methods of tiedown, blocking, bracing, waterproofing, etc. employed. Record any deviations from applicable Military Standards. (See c. 1) below.)

c. After the test item has been offloaded, remove all items from the shipping container, if any, and --

1) Visually inspect the shipment; evaluate with regard to, and record any deviations from, the applicable portions of the following military standards:

- a) MIL-STD-129 Marking for Shipment and Storage.
- b) MIL-STD-130 Identification Marking of U.S. Military Property.
- c) MIL-STD-1186 Cushioning, Anchoring, Bracing, Blocking and Waterproofing, and Appropriate Test Methods.

2) Record any damage or deterioration resulting from handling, improper packaging, and/or inadequate preservation.

3) Observe and record the extent of depreservation required.

4) Inspect the test item and record any evidence of defects in the following areas:

- a) Workmanship/Construction/Materials: In general the test item should be well made and free from defects. Methods of construction should indicate sound design and good shop practice. Materials should be new and as authorized by the applicable component specifications.

b) Visual inspection shall concentrate on the following:

1. Plastic shall be neatly molded and free from roughness, irregularities, foreign material or detrimental defects. The surface shall contain no porous areas or bubbles.
2. Metallic materials shall be free from kinks, excessive scratches and sharp bends. All burrs and rough edges, which offer a potential hazard to personnel, shall be removed.
3. Joints, connections and attachments shall be in accordance with the applicable specifications and adequate to ensure watertightness and strength. All seams shall be smooth, uniform, and free from faults, dirt, or other extraneous material.
4. Painted or finished surfaces should be adequately covered, even and smooth in finish, texture and appearance, and consistent in color.
- 5) Record any observed defect or condition which is considered to be a potential hazard to the safety of test personnel or facilities.
- 6) Photograph the test item, accessories, and special equipment in the received condition.

6.1.2 Inventory Check

a. Conduct an inventory against the Basic Issue Item List (BIIL). Note evidence of the following:

- 1) Missing maintenance literature or draft technical manuals.
- 2) Shortages in rations.
- 3) Missing accessory packets.

b. Submit an EPR for each noted shortage or discrepancy in accordance with applicable procedures in USATECOM Regulation 70-23.

6.1.3 Physical Characteristics

Perform the applicable procedures of MTP 10-2-500; note data as follows:

- a. Manufacturer and model, type/class.
  - 1) Rations.
  - 2) Food service equipment.
- b. Date rations packed.

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c. Weight and overall dimensions of test items.

d. Safety equipment supplied.

6.1.4 Operator Training and Familiarization

Members of the test team shall be oriented in accordance with MTP 10-2-501.

a. Record the rank, MOS, past experience, and extent of additional training required for each test team member.

b. Review test personnel in all safety precautions and hazards associated with the test item, test facilities and testing procedures.

c. Instruct test personnel in the capabilities, operational characteristics, and limitations, in accordance with guidance contained in the draft technical manuals and other instructional material. Training, instruction, and familiarization shall include but not be limited to the following:

- 1) Applicable terminology.
- 2) Operation and use of test facilities.
- 3) Furnish the team members information concerning the test item as follows:
  - a) Physical characteristics and description.
  - b) Limitations.
  - c) Maintenance and service requirements.
  - d) Tools, accessories, and repair parts.
  - e) Kits.
  - f) Other information as appropriate.
- 4) Instruct test team members in test objectives and detailed procedures for subtests.
- 5) Record the adequacy and completeness of the draft technical manual(s) and/or other instructional material.

6.1.5 Preoperational Inspection, Assembly, and Functional Check

Procedures as outlined in this section are intended to accomplish the following:

a. Ensure that all items removed for shipment are reinstalled and that the test item is complete in all respects.

b. Detect, prior to the accomplishment of testing procedures, any condition of the test item, its attachments or accessories, which constitutes a potential hazard to personnel, the test item, or the test facilities.

c. Detect, repair, or adjust defects, malfunctions, or conditions of the test item which would alter its operational characteristics such that the test data taken would not be representative of the commodity item.

d. In general, determine that the test item is safe, operable and otherwise ready for testing.

#### 6.1.5.1 Inspection and Assembly

Review the draft technical manual(s) and other literature and instructional material as furnished with the test item; observe the procedures and precautions as listed therein and proceed as follows:

a. Ensure that all preservations and protective materials have been removed.

b. Refer to the draft technical manual(s) and accomplish the specified post arrival assembly and installation of components and accessories, including reinstallation of those items which were removed for the purpose of shipment.

c. Accomplish the following and record any faults, failures, malfunctions, or discrepancies.

- 1) Check thoroughly for physical damage, missing parts, and loose connections.
- 2) Manipulate all controls and check for proper operation and adjustment.
- 3) Record the presence and adequacy of name plates, warning plates, and instruction plates.

#### 6.1.5.2 Operational Check and Functional Verification

Ensure that the test item is operational. Proceed as follows:

a. Refer to the draft technical manual(s) and accomplish all preoperational maintenance and service.

b. Record the following:

- 1) Satisfactory operation.
- 2) Adequacy of the draft technical manual(s) and other instructional material.
- 3) Any fault, malfunction, failure, or discrepancy observed.
- 4) Test item suitable for further testing.

## 6.2 TEST CONDUCT

The testing program shall be arranged to determine by controlled, measured, and instrumented testing, the technical performance and safety characteristics of the test item.

NOTES:

1. All equipment malfunctions occurring during the testing procedures shall be reported in accordance with USATECOM Regulation 70-23.
2. Prior to initiating test procedures, the test officer will review and implement all safety considerations contained in Section 6.2.8.

### 6.2.1 Performance

Evaluate the operational and performance characteristics of the test item by subjecting it to the following procedures:

#### 6.2.1.1 Field Cooking Outfit, Small Detachment

a. The field cooking outfit, small detachment, consists of a stove, attachments and the cooking utensils required to prepare rations for 15 to 40 men. It is designed for outdoor use by isolated detachments. Subject the field cooking outfit to the applicable procedures of MTP 10-2-037.

##### b. Food service preparation method

- 1) Meal, combat, individual and meal, quick-serve.
  - a) Food will be prepared by laboratory personnel; required equipment will consist solely of a means for heating water.
  - b) Heat all unopened canned meat items in hot water in either the 11- or the 13 1/2-quart cooking pot.
  - c) Use both 6-quart cooking pots with covers for heating water for beverages and to reconstitute dehydrated foods in flexible packages.
  - d) Use frying pans for heating opened canned meat items.
- 2) Ration, operational, B.
  - a) Food will be prepared by laboratory personnel. The new food processing techniques will be used to produce this type of meal.
  - b) Use either the 11- or the 13 1/2-quart cooking pot partially filled with water to heat unopened cans of meat and vegetables.
  - c) Use the 6-quart cooking pots to heat water for beverages, to reconstitute dehydrated meats and vegetables, or to heat cereals and soups.

- d) Place the windshield cover over the windshield to prevent heat from escaping while the food is heating.
- e) Use frying pans for heating opened canned meats, frying of reconstituted dehydrated meats and potatoes.

c. Maintain a record of the following:

- 1) Data from the applicable procedures of MTP 10-2-037.
- 2) Type of ration.
- 3) Preparation procedure for each food component.
- 4) Adequacy of equipment.

- a) Cooking utensils.
- b) Heating apparatus.
- c) Condition after use.
- d) Ease of cleaning.

5) Adequacy of food preparation and heating method(s).

- a) Food was not heated enough.
- b) Food scorched.
- c) Food not heated throughout.

6) Time required to:

- a) Prepare stove for use (to include igniting).
- b) Prepare food (to include beverage).

NOTE: Timing will include opening rations, preparing stove, to food consumption.

- 7) Ability of the laboratory technician to prepare the rations with little or no instruction.
- 8) Results of laboratory analysis of random sample of each menu.
- 9) Retain a copy of preparation instructions provided with each type of ration, if available.

6.2.1.2 Stove, Gasoline, Two-Burner

a. The stove, gasoline, two-burner is designed for the use of troops who prepare and cook their own food and is used extensively by mountain and jungle troops. Food for 6 to 15 persons can be prepared with this stove. Subject the two-burner gasoline stove to the applicable procedures of MTP 10-2-037.

b. Food service preparation method.

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- 1) Use the carrying case cover as a griddle.
- 2) Use the carrying case as a sterilizing pan to heat water for washing mess kits and the griddle or to heat canned meat items.
- 3) Heat water in a cookset cooking pot while heating food or frying bacon in cookset frying pan.
- 4) Use canteen cup to heat water for beverages, to reconstitute dehydrated meats and vegetables in flexible packages and use mess kit pan to fry bacon or heat food.

c. Maintain a record of the following:

- 1) Data obtained from the applicable procedures of MTP 10-2-037.
- 2) Type of ration.
- 3) Preparation procedure for each food component.
- 4) Adequacy of equipment.
  - a) Cooking utensils.
  - b) Heating apparatus.
- 5) Adequacy of food preparation and heating method(s).
  - a) Food was not heated enough.
  - b) Food scorched.
  - c) Food not heated throughout.
- 6) Time required to:
  - a) Prepare stove for use (to include igniting).
  - b) Prepare food (to include beverage).

NOTE: Timing will include opening rations, preparing stove, to food consumption.

- 7) Ability of the laboratory technician to prepare the the rations with little or no instruction.
- 8) Results of laboratory analysis of random sample of each menu.
- 9) Retain a copy of preparation instructions provided with each type of ration, if available.

6.2.1.3 Range Outfits, Field, Gasoline

- a. Gasoline field range outfits are adaptable to the different cooking requirements of field operations. The ranges, which may be used singly (for 50 men) or in a group, are portable and can be operated in transit. The necessary pots, pans, cooking and serving utensils, and knives come with each range.

b. Food service preparation methods.

Foods may be prepared on or in the range outfits by baking, roasting, boiling, griddle cooking, and deep-fat frying if the fire or burner unit is placed in the proper position.

1) Baking.

- a) Bake biscuits and cobblers with the fire unit in either the bottom or middle position depending upon the model or type of range under test. Follow the instructions in the draft technical manual or manufacturer's direction sheet for the proper placement of the baking pan and open/closed position of the range cabinet front and top doors.
- b) Repeat a) above, except bake cake after having made appropriate readjustments in accordance with pertinent instructions.

2) Roasting.

- a) Place the fire unit in the middle or bottom position, as applicable.
- b) Place the roasts, in the baking and roasting pan, in the top position (or as instructed).
- c) Cover pan if roasts are to be cooked by the moist-heat method. Close cabinet front and top doors.

3) Roasting - Alternate method (depending upon test item).

- a) Place the burner unit in either the top or bottom position.
- b) Place roasts, in baking and roasting pan, on top of range.
- c) Cover pan if roasts are to be cooked by the moist-heat method. Close door and lid of cabinet.

4) Boiling.

- a) Place the fire or burner unit in the proper position as instructed.
- b) Use either the 40- or the 60-quart cooking pot, covered, for boiling. Place the cooking pot in the cooking pot cradle in the bottom of the cabinet.
- c) Close cabinet front and top doors.
- d) To operate as a double boiler, cover the bottom of the 60-quart cooking pot with water, place pot in cradle, place 40-quart pot into the 60-quart pot and cover.
- e) Boiling and roasting may be done at the same time.

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4) Griddle cooking.

- a) Place the fire or burner unit in the top position, or as instructed.
- b) Adjust top of range to receive griddle by positioning griddle supports or as instructed.
- c) Place griddle in position.
- d) Fit arm protector(s) (if furnished) in accordance with directions.
- e) Close cabinet front door.

5) Deep-fat frying.

- a) Place the fire unit in the middle position and place baking and roasting pan in the top position or place the burner unit in the top position and place the baking and roasting pan on top of the range, as appropriate.
- b) Fit arm protectors (if furnished) over front and one side of cabinet and over corresponding edges of pan.
- c) Fill pan one-third to one-half full of melted shortening. Heat shortening and drop a bread cube into the hot grease, if the bread cube browns in about 20 seconds, the grease is hot enough to add the food to be fried.
- d) Close cabinet front door but leave top door open to prevent steam from forming.

c. Maintain a record of the following:

- 1) Type of ration.
- 2) Preparation procedure for each food component.
- 3) Adequacy of equipment.
  - a) Cooking utensils.
  - b) Heating apparatus and ovens for baking, roasting, boiling, grilling, or frying.
- 5) Adequacy of food preparation instructions.
- 6) Time required to:
  - a) Prepare range for baking, roasting, boiling, grilling or frying. (To include igniting and adapting range for each operation.)
  - b) Prepare food (to include beverage).

NOTE: Timing will include opening rations, adapting ranges, to food consumption.

- 7) Temperatures attained during preparation.
- 8) Results of laboratory analysis of random sample of each ration.
- 9) Retain a copy of preparation instructions provided with each type of ration, if available.

#### Nutritional Evaluation

a. Basically, the determination of nutritional requirements of rations is the responsibility of the Office of the Surgeon General. However, as part of the Engineering Test, data relevant to nutritional aspects shall be obtained as follows.

b. Determine whether the rations conform to nutritional requirements as specified in Appendix 5, AR 40-5 by conducting the applicable sections outlined in Methods of Analysis of the Association of Official Agricultural Chemists.

NOTE: Nutritional Analyses of rations procured for the engineering test may be accomplished by qualified personnel assigned to the test agency.

#### Environmental Effects Evaluation

The purpose of these tests is to determine the ability of the test item and the various components and accessories to resist physical damage and/or deterioration when subjected to accelerated climatic and environmental conditions. Testing should be conducted as necessary to ensure that the test item's performance requirements are satisfactory under conditions existing within the operating areas and/or environments as specified by the applicable MN and as defined by AR 70-38.

##### 6.2.3.1 Tropic Environment Evaluation

Accomplish the applicable procedures of MTP 10-4-003. Note the test data.

##### 6.2.3.2 Desert Environment Evaluation

Accomplish the applicable procedures of MTP 10-4-001. Note the test data.

##### 6.2.3.3 Arctic Environment Evaluation

Accomplish the applicable procedures of MTP 10-4-004. Note the test data.

6.2.3.4        **Explosive Atmosphere Test**

Subject the test item as applicable to the explosive atmosphere test described in Method 511 of MIL-STD-810. This will ensure the safe operation of test items when used with fuels such as gasoline.

6.2.4        **Transportability**

NOTE: Personnel should be familiar with the applicable portions of:

1. MIL-STD-129, Marking for Shipment and Storage.
2. MIL-STD-209, Slinging Eyes and Attachments for Lifting and Tying Down Military Equipment.

a. Appropriate literature shall be reviewed or consulted for proper procedures for tying down, lifting, and transporting pre-packed palletized rations and/or food preparation equipment by various media. Any inadequacy of instructions should be reported by EPR.

b. Evaluate the transportability characteristics of the test item by accomplishing the applicable procedures of MTP 10-2-503. Note the test data.

6.2.5        **Durability**

The test items durability shall be verified by performing the applicable procedures of MTP 10-2-502 and the following:

a. During accomplishment of testing as described by this document, the durability characteristics of the test item shall be observed. In the event of equipment failure during testing, maintenance and repair procedures shall be accomplished and the testing shall be continued.

b. Upon completion of all testing as described in this document, the test item shall be inspected for signs of excessive or accelerated wear and potential equipment failure.

c. Record test data as required by MTP 10-2-502 and any indication of the following:

- 1) Fastening failure.
- 2) Loose or missing hardware.
- 3) Excessive wear.
- 4) Warping and/or distortion.
- 5) Damage to any component, material or finish.

6.2.6        **Maintenance Evaluation**

a. Evaluate and appraise the maintenance - related factors

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of the test item as described in MTP 10-2-507 and AMC Pamphlet 706-134 with emphasis on the following:

- 1) Organizational (O), Direct Support (F), and General Support (H) maintenance requirements.
- 2) Operator through General Support Maintenance Literature.
- 3) Repair parts.
- 4) Tools.
- 5) Test and handling equipment.
- 6) Maintenance facilities.
- 7) Personnel skill requirements.
- 8) Maintainability.
- 9) Availability.

b. Obtain the data required by Appendix B of USATECOM Regulation 750-15, to enable the calculation of those indicators which express the effects of the preceding aspects.

#### 6.2.7 Safety

Evaluate the safety characteristics and features of the test item in accordance with the applicable procedures in MTP 10-2-508.

NOTES:

1. Provide a safety recommendation in accordance with USATECOM Regulation 385-6, and the test directive, as applicable.
2. During the conduct of all tests, test personnel shall observe the proper safety precautions and, in particular, shall adhere closely to the draft technical manual for the handling and use of the test item.
3. The procedures for all tests shall be examined, and any condition which might constitute a safety hazard shall be recorded and reported.

Perform the following:

a. Examine the safety characteristics of the test item, including the procedures for its preparation, use and design to ensure that maximum safety has been provided consistent with military requirements. Hazards shall be classified as safe, marginal, critical, and catastrophic. Consider the following:

- 1) Examine for packaging that would subject the user to any safety hazards.
- 2) Examine rations to determine the food components are safe for human consumption.
- 3) Examine operating procedures for food preparation equipment in the light that improperly executed or misinterpreted instructions could result in bodily harm or equipment damage.

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b. Test personnel shall record any worthwhile comments or suggestions relative to improvement of safety measures, and/or precautions.

6.2.8 Human Factors Evaluation

Accomplish the applicable procedures of MTP 10-2-505 and the following general evaluation:

a. The test item shall be evaluated to determine the degree to which its physical design and revealed performance characteristics conform to recognized human factors engineering design criteria. Use the applicable requirements of Human Factors Evaluation Data for General Equipment (HEDGE), for Class III C and Class IV B. Prepare checklists to evaluate the human factors characteristics to be considered during conduct of the denoted tests.

b. In some instances the HEDGE test functions and subtests may be under consideration during the conduct of other tests. Where this condition exists the HEDGE requirements will be integrated into and conducted simultaneously with the corresponding tests.

c. General considerations to be included in checklists for all tasks:

- 1) Adequacy of instructions to perform the task.
- 2) Mental and physical effort required.
- 3) Design of the test item as it affects the task.
- 4) Time required to perform the task.

d. Specific considerations to be included for the HEDGE test functions; rate each task from a human factors standpoint:

- 1) Labels waterproof for field use items.
- 2) Spoilage indications clearly described.
- 3) Allowance for operator to perform required functions when wearing gloves, mitts, etc.
- 4) Preparation methods simple to use.
- 5) Equipment sufficiently insulated or shielded to protect user from burns due to accidental contact.
- 6) Discomfort from radiated heat controlled to the greatest extent possible.

e. Perform the following tasks for the HEDGE test functions given and rate the task from a human factors standpoint. The considerations shall include, but not be limited to, the following:

- 1) Operability.
  - a) Unpackage.
  - b) Prepare.
  - c) Consume.

2) **Transportability.**

- a) Prepare for transport by placing in a transit configuration.
- b) Load/unload.
  1. Lift into/out of carrier.
  2. Secure/unfasten (to carrier).

6.2.9

Value Analysis

a. During the conduct of all tests, test personnel shall evaluate the test item from a value versus cost standpoint. Record all pertinent comments concerning features or components which can be eliminated or modified to accomplish cost reduction without impairment of performance, reliability, quality, maintainability or safety. The applicable portions of USATECOM Regulation 700-1 shall be used for this evaluation.

b. During handling, preparation, and consumption of the ration, observations shall be made for features which could be eliminated without compromising the ration nutritional value, physiological effects, or the reliability, durability, or safety of the equipment.

c. Question test team personnel and users for features of the test item that may be eliminated without decreasing the functional value of the test item.

d. Note the following:

- 1) Nonfunctional features.
- 2) Costly features.
- 3) Nice-to-have features.
- 4) Comments of test team personnel and users.

6.2.10

Quality Assurance

Throughout all tests, examine the test item for compliance with the quality requirements of the applicable MN and the provisions of MTP 10-2-511.

6.2.11

Reliability

Evaluate and appraise the reliability factors of the test item described in MTP 10-2-512.

6.3

TEST DATA

NOTE: In compiling the Test Data section, test personnel should expound upon those data procedures which are other than

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quantitative in nature by recording narrative descriptions which will provide full details of conditions and/or events occurring during the conduct of the test.

6.3.1 Preparation for Test

6.3.1.1 Inspection

Record the following:

- a. Manufacturer, nomenclature, and other appropriate data.
- b. Method of transport used to deliver the test item.
- c. Any damage to the test item.
- d. Any damage or deterioration resulting from handling, improper packaging, and/or inadequate preservation.
- e. Any noncompliance with the standards for shipping, marking, preservation, and packaging.
- f. The extent of depreservation required.
- g. Any indication of defects in the following areas (describe in detail):
  - 1) Workmanship.
  - 2) Construction.
  - 3) Materials.
- h. Any condition considered to be a potential hazard to the safety of test personnel or facilities.
- i. Equipment, time, and personnel required to unpack the test item and comments concerning the method and materials used in packing.
- j. Suitability of the test item for testing.

6.3.1.2 Inventory Check

List any materials missing from the Basic Issue Item List.

6.3.1.3 Physical Characteristics

Record the data required by MTP 10-2-500 and as follows:

- a. Manufacturer and model, type/class.

- 1) Rations.
- 2) Food service equipment.

- b. Date rations packed.
- c. Weight and overall dimensions of test items.
- d. Safety equipment supplied.

6.3.1.4      **Operator Training and Familiarization**

Record the data required by MTP 10-2-501 and the following:

- a. Methods used and completion of test personnel training and evaluation of technical manuals.
- b. Evidence that test personnel are sufficiently knowledgeable in objectives and procedures.
- c. The personal data required for selected personnel.

6.3.1.5      **Preparational Inspection, Assembly, and Functional Check**

6.3.1.5.1      **Inspection and Assembly**

Record the following:

- a. Any damage or defects observed. (Describe in detail.)
- b. Adequacy and completeness of accessories and tools necessary for their installation
- c. Satisfactory operation of all controls and moving parts.
- d. Adequacy of instructional material, instructional plates, name plates, and warning plates.
- e. Overall suitability of the test item for testing.

6.3.1.5.2      **Operational Check and Functional Verification**

Record the following:

- a. Satisfactory operation.
- b. Adequacy of draft technical manual(s) and other instructional material.
- c. Any fault, failure, malfunction, or discrepancy noted.

d. Suitability of the test item for testing.

6.3.2 Test Conduct

6.3.2.1 Performance

6.3.2.1.1 Field Cooking Outfit, Small Detachment

Record the following:

a. Data from the applicable procedures of MTP 10-2-037.

b. Type of ration.

c. Preparation procedure for each food component.

d. Adequacy of equipment.

- 1) Cooking utensils.
- 2) Heating apparatus.
- 3) Condition after use.
- 4) Ease of cleaning.

e. Adequacy of food preparation and heating method(s).

- 1) Food was not heated enough.
- 2) Food scorched.
- 3) Food not heated throughout.

f. Time required to:

- 1) Prepare stove for use (to include igniting).
- 2) Prepare food (to include beverage).

NOTE: Timing will include opening rations, preparing stove, to food consumption.

g. Ability of the laboratory technician to prepare rations with little or no instructions.

h. Results of laboratory analysis of random sample of each menu.

i. Retain a copy of preparation instructions provided with each type of ration, if available.

6.3.2.1.2 Stove, Gasoline, Two-Burner

Record the following:

a. Data obtained from the applicable procedures of MTP 10-2-037.

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- b. Type of ration.
- c. Preparation procedure for each food component.
- d. Adequacy of equipment.
  - 1) Cooking utensils.
  - 2) Heating apparatus.
- e. Adequacy of food preparation and heating method(s).
  - 1) Food was not heated enough.
  - 2) Food scorched.
  - 3) Food not heated throughout.
- f. Time required to:
  - 1) Prepare stove for use (to include igniting).
  - 2) Prepare food (to include beverage).
- NOTE: Timing will include opening rations, preparing stove, to food consumption.
- g. Ability of the laboratory technician to prepare rations with little or no instruction.
- h. Results of laboratory analysis of random sample of each menu.
  - i. Retain a copy of preparation instructions provided with each type ration, if available.

6.3.2.1.3 Range Outfits, Field, Gasoline

Record the following:

- a. Type of ration.
- b. Preparation procedure for each food component.
- c. Adequacy of equipment.
  - 1) Cooking utensils.
  - 2) Heating apparatus and ovens for baking, roasting, boiling, grilling, or frying.
- d. Adequacy of food preparation instructions.

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e. Time required to:

- 1) Prepare range for baking, roasting, boiling, grilling or frying. (To include igniting and adapting range for each operation.)
- 2) Prepare food (to include beverage).

NOTE: Timing will include opening rations, adapting ranges, to food consumption.

f. Temperatures obtained during preparation.

g. Results of laboratory analysis of random sample of each ration.

h. Retain a copy of preparation instructions provided with each type of ration, if available.

6.3.2.2 Nutritional Evaluation

Data shall be collected and recorded as described in AR 40-5, Appendix 5, and applicable sections of Methods of Analysis of the Association of Official Agricultural Chemists.

6.3.2.3 Environmental Effects Evaluation

6.3.2.3.1 Tropic Environment Evaluation

Record data as required by MTP 10-4-003.

6.3.2.3.2 Desert Environment Evaluation

Record data as required by MTP 10-4-001.

6.3.2.3.3 Arctic Environment Evaluation

Record data as required by MTP 10-4-004.

6.3.2.3.4 Explosive Atmosphere Test

Record data as required by MIL-STD-810, Method 511.

6.3.2.4 Transportability

Record data as required by MTP 10-2-503 and as follows:

- a. Item under test (indicate manufacturer, model, etc.).
- b. Packaging or preparation methods used.

- c. Dimensions in transport configuration.
- d. Weight in transport configuration.
- e. Time required to accomplish preparations for shipment.
- f. MHE used.
- g. Method of transport utilized.
- h. Any evidence of shifting of contents, loosening or breaking of holdowns, ties, stays, blocking, or bracing.

6.3.2.5 Durability

Record data as required by MTP 10-2-502 and the following:

- a. Fastening failure.
- b. Loose or missing hardware.
- c. Excessive wear.
- d. Warping and/or distortion.
- e. Damage to any component, material or finish.

6.3.2.6 Maintenance Evaluation

Record data as required by the applicable portions of MTP 10-2-512 and the following:

- a. Maintenance literature which is not easily understood, incomplete or ineffective.
- b. Repair parts which are not proper type or are nonstandard.
- c. Ineffective or improperly specified tools.
- d. All applicable data as required to permit the computations as required by Appendix B, USATECOM Regulation 750-15.

6.3.2.7 Safety

Record appropriate data as required by MTP 10-2-508 and as follows:

- a. Prepare a list of warning labels, instructions, and markings. Record the location and adequacy of each item listed.

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- b. List any condition that might present a safety hazard including the cause of the hazard, and the steps taken to alleviate the condition.
- c. Any indications that rations were unfit for human consumption.
- d. List any suggestions relative to improvement of safety features, safety measures and/or precautions.
- e. Provide a safety recommendation in accordance with USATECOM Regulation 385-6.

#### 6.3.2.8 Human Factors Evaluation

Record the data required by MTP 10-2-505.

Prepare checklists for each of the various tasks associated with each test function. Rate each task as satisfactory from a human factors standpoint. In rating the task, include the specific considerations peculiar to the task and the following general considerations:

- a. Adequacy of instructions to perform the task.
- b. Mental and physical effort required.
- c. Design of the test item as it affects the task.
- d. Time required to perform the task.

#### 6.3.2.9 Value Analysis

a. Record comments for each of the topics listed below:

- 1) Nonfunctional features.
- 2) Costly features.
- 3) Nice-to-have features.
- 4) Comments of test item personnel and users.

b. When making recommendations for changes in the test item's features or components, record the following:

- 1) The feature or component under consideration.
- 2) Recommended change(s).
- 3) Reason(s) for recommended change(s).

#### 6.3.2.10 Quality Assurance

Record:

- a. Data required by MTP 10-2-511.

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b. Comments as to any design shortcomings in the area of required quality.

6.3.2.11 **Reliability**

Record the data required by procedures of MTP 10-2-512.

6.4 **DATA REDUCTION AND PRESENTATION**

6.4.1 **Data Reduction**

Organize, analyze and summarize all raw data as specified in each of the MTP referred to in paragraph 6.2. Use tabulations and charts as appropriate. Make a succinct, unbiased, and independent analysis of test data to show:

a. The degree to which the test item meets stated requirements (test criteria) in MN or other approved documents.

b. Deficiencies, shortcomings and suggested improvements.

6.4.2 **Data Presentation**

Evaluate and present a complete data summary indicating the results and address the following:

a. Item characteristics such as performance, reliability, durability and human factors engineering.

b. Comparison of test item characteristics with those of a similar item or standard (control item). Show whether the test item offers a significant improvement (or not) over the control item or only a minimal and perhaps costly improvement.

c. Safety characteristics and safety recommendation. All aspects of safety must be evaluated to determine if a safety recommendation can be given or must be withheld pending correction of any hazards found.

d. Conclusions and recommendations on overall test objectives and the suitability of the test item for service testing.